Analysis of Redi Rock wall

Input data

Project : Bottini Properties
Description : 8' High Wall
Customer : Bottini Properties
Date : 10/31/2026

Settings

USA - Safety factor



Wall analysis

Verification methodology :	Safety factors (ASD)
Active earth pressure calculation :	Coulomb
Passive earth pressure calculation :	Mazindrani (Rankine)
Earthquake analysis :	Mononobe-Okabe
Shape of earth wedge :	Calculate as skew
Allowable eccentricity :	0.333
Internal stability :	Standard - straight slip surface
Reduction coeff. of contact first block - base :	1.00

Safety factors			
Permanent design situation			
Safety factor for overturning :	SF_o =	1.50	[–]
Safety factor for sliding resistance :	SF_s =	1.50	[–]
Safety factor for bearing capacity :	SF_b =	2.00	[–]
Safety factor for sliding along geo-reinforcement :	SF_{sr} =	1.50	[–]
Safety factor for geo-reinforcement strength :	SF_{st} =	1.50	[–]
Safety factor for pull out resistance of geo-reinf. :	SF_{po} =	1.50	[–]
Safety factor for connection strength :	SF_{con} =	1.50	[–]

Blocks

No.	Description	Block height h [in]	Block width w [in]	Unit weight γ [pcf]
1	Block 28	18.00	28.00	120.00
2	Top block 28	18.00	28.00	120.00

No.	Description	Shear bearing capacity of joint F_{min} [lbf/ft]	Max. shear strength F_{max} [lbf/ft]	Block friction f [°]
1	Block 28	6061.00	11276.00	44.00
2	Top block 28	6061.00	11276.00	44.00

Setbacks

No.	Setback s [in]
1	0.000
2	0.033
3	0.135

[Redi-Rock - Redi-Rock Wall + (32 bit) | version 5.2024.137.0 | Copyright © 2025 Fine spol. s r.o. All Rights Reserved | www.finesoftware.eu]
[Redi-Rock International | (231) 237 - 9500 ext 3010| engineering@redi-rock.com| www.redi-rock.com]

No.	Setback s [in]
4	0.781
5	1.385

Geometry

No. group	Description	Count	Setback s [in]
1	Block 41 PC	1	0.13
2	Block 28	4	0.13
3	Top block 28	1	-

Base

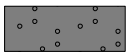
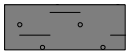
Geometry

Upper setback a_1 = 0.00 ft
Lower setback a_2 = 1.00 ft
Height h = 1.50 ft
Width b = 4.50 ft

Material

Soil creating foundation - Well graded sand (SW), medium dense

Basic soil parameters

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [psf]	γ [pcf]	γ_{su} [pcf]	δ [°]
1	Well graded sand (SW), medium dense		36.50	0.0	127.00	64.50	36.00
2	Sandy clay (CS), firm consistency		24.50	280.0	118.00	55.50	24.00
3	Sandy clay (CS)		24.50	280.0	118.00	55.50	24.00

All soils are considered as cohesionless for at rest pressure analysis.

Soil parameters

Well graded sand (SW), medium dense

Unit weight : γ = 127.0 pcf
Stress-state : effective
Angle of internal friction : φ_{ef} = 36.50 °
Cohesion of soil : c_{ef} = 0.0 psf
Angle of friction struc.-soil : δ = 36.00 °
Saturated unit weight : γ_{sat} = 127.0 pcf

Sandy clay (CS), firm consistency

Unit weight : γ = 118.0 pcf
Stress-state : effective
Angle of internal friction : φ_{ef} = 24.50 °
Cohesion of soil : c_{ef} = 280.0 psf
Angle of friction struc.-soil : δ = 24.00 °
Saturated unit weight : γ_{sat} = 118.0 pcf

Sandy clay (CS)

[Redi-Rock - Redi-Rock Wall + (32 bit) | version 5.2024.137.0 | Copyright © 2025 Fine spol. s r.o. All Rights Reserved | www.finesoftware.eu]
[Redi-Rock International | (231) 237 - 9500 ext 3010| engineering@redi-rock.com| www.redi-rock.com]

Unit weight : $\gamma = 118.0$ pcf
Stress-state : effective
Angle of internal friction : $\varphi_{ef} = 24.50$ °
Cohesion of soil : $c_{ef} = 280.0$ psf
Angle of friction struc.-soil : $\delta = 24.00$ °
Saturated unit weight : $\gamma_{sat} = 118.0$ pcf

Backfill

Assigned soil : Well graded sand (SW), medium dense
Slope = 45.00 °

Geological profile and assigned soils

No.	Thickness of layer t [ft]	Depth z [ft]	Assigned soil	Pattern
1	-	0.00 .. ∞	Sandy clay (CS)	

Terrain profile

Terrain behind construction has the slope 1: 4.00 (slope angle is 14.04 °).

Water influence

Ground water table is located below the structure.

Resistance on front face of the structure

Resistance on front face of the structure: 1/3 pass., 2/3 at rest
Soil on front face of the structure - Sandy clay (CS)
Soil thickness in front of structure $h = 3.00$ ft
Soil slope in front of structure $\beta = -10.00$ °

Settings of the stage of construction

Design situation : permanent
Reduction of soil/soil friction angle : do not reduce

Verification No. 1

Forces acting on construction

Name	F_{hor} [lbf/ft]	App.Pt. z [ft]	F_{vert} [lbf/ft]	App.Pt. x [ft]	Design coefficient
Weight - wall	0.0	-4.40	3472.9	2.50	1.000
FF resistance	-1443.0	-1.30	-221.3	-0.58	1.000
Weight - earth wedge	0.0	-1.60	2.5	4.42	1.000
Weight - earth wedge	0.0	-3.62	107.0	3.83	1.000
Weight - earth wedge	0.0	-10.40	141.3	3.07	1.000
Active pressure	1826.3	-3.59	1743.5	4.12	1.000

Verification of complete wall

Check for overturning stability
Resisting moment $M_{res} = 16871.4$ lbfft/ft
Overturning moment $M_{ovr} = 4682.6$ lbfft/ft

Safety factor = 3.60 > 1.50
Wall for overturning is SATISFACTORY

[Redi-Rock - Redi-Rock Wall + (32 bit) | version 5.2024.137.0 | Copyright © 2025 Fine spol. s r.o. All Rights Reserved | www.finesoftware.eu]
[Redi-Rock International | (231) 237 - 9500 ext 3010| engineering@redi-rock.com| www.redi-rock.com]

Check for slip
Resisting horizontal force H_{res} = 3650.70 lbf/ft
Active horizontal force H_{act} = 383.25 lbf/ft

Safety factor = 9.53 > 1.50
Wall for slip is SATISFACTORY

Overall check - WALL is SATISFACTORY

Dimensioning No. 1

Forces acting on construction

Name	F_{hor} [lbf/ft]	App.Pt. z [ft]	F_{vert} [lbf/ft]	App.Pt. x [ft]	Design coefficient
Weight - wall	0.0	-2.87	1588.1	1.36	1.000
Weight - earth wedge	0.0	-5.90	141.3	1.80	1.000
Active pressure	534.8	-2.19	339.0	2.53	1.000

Verification of block No. 3

Check for overturning stability
Resisting moment M_{res} = 3266.2 lbfft/ft
Overturning moment M_{ovr} = 1173.3 lbfft/ft

Safety factor = 2.78 > 1.50
Joint for overturning stability is SATISFACTORY

Check for slip
Resisting horizontal force H_{res} = 8058.47 lbf/ft
Active horizontal force H_{act} = 534.77 lbf/ft

Safety factor = 15.07 > 1.50
Joint for verification is SATISFACTORY

Bearing capacity of foundation soil

Design load acting at the center of footing bottom

No.	Moment [lbfft/ft]	Norm. force [lbf/ft]	Shear Force [lbf/ft]	Eccentricity [–]	Stress [psf]
1	-385.5	5245.92	383.25	0.000	1165.8

Service load acting at the center of footing bottom

No.	Moment [lbfft/ft]	Norm. force [lbf/ft]	Shear Force [lbf/ft]
1	-385.5	5245.92	383.25

Verification of foundation soil

Stress in the footing bottom : rectangle

Eccentricity verification
Max. eccentricity of normal force e = 0.000
Maximum allowable eccentricity e_{alw} = 0.333

Eccentricity of the normal force is SATISFACTORY

[Redi-Rock - Redi-Rock Wall + (32 bit) | version 5.2024.137.0 | Copyright © 2025 Fine spol. s r.o. All Rights Reserved | www.finesoftware.eu]
[Redi-Rock International | (231) 237 - 9500 ext 3010| engineering@redi-rock.com| www.redi-rock.com]

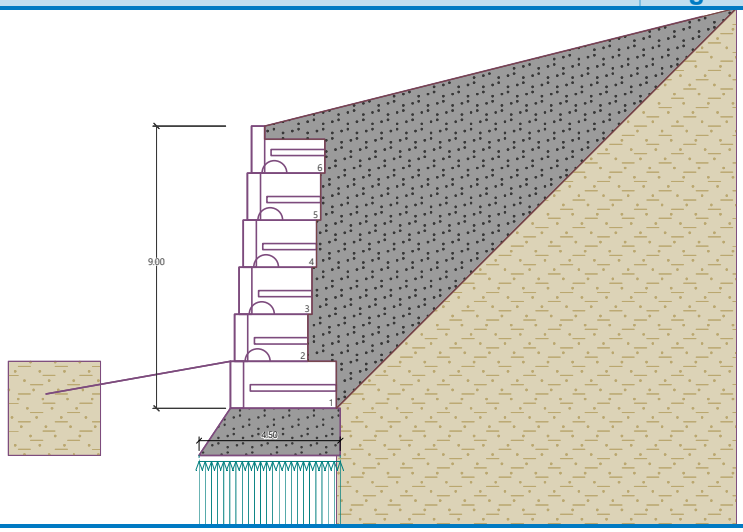
Verification of bearing capacity

Max. stress at footing bottom σ = 1165.8 psf
Allowable bearing capacity of foundation soil R_d = 3000.0 psf

Safety factor = 2.57 > 2.00
Bearing capacity of foundation soil is SATISFACTORY

Overall verification - bearing capacity of found. soil is SATISFACTORY

Name : Bearing cap.	Stage - analysis : 1 - -1



Slope stability analysis

Input data (Construction stage 1)

Project

Settings

USA - Safety factor

Stability analysis

Verification methodology : Safety factors (ASD)
Earthquake analysis : Standard

Safety factors			
Permanent design situation			
Safety factor :	SF_s =	1.50	[–]

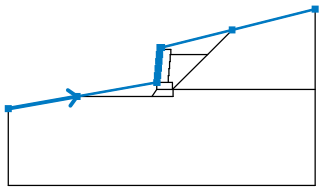
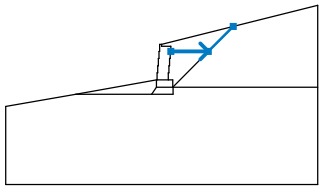
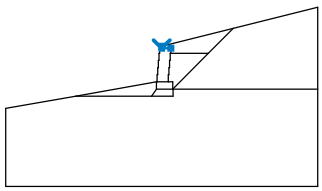
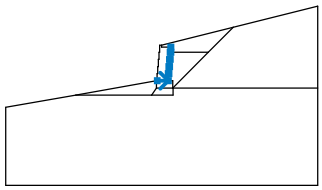
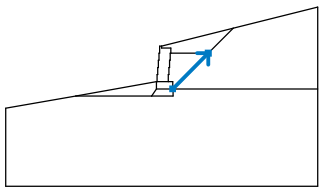
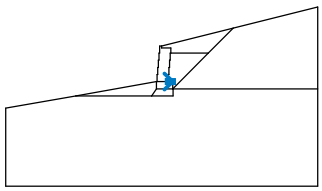
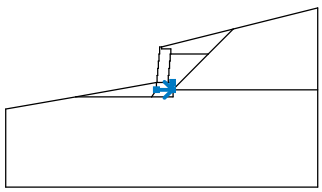
Anchors

Verification methodology : Safety factors (ASD)

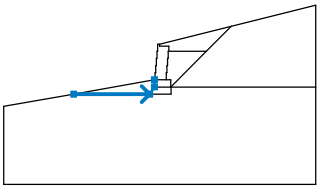
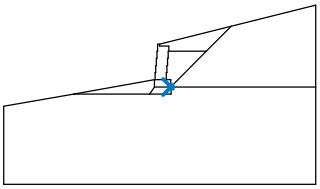
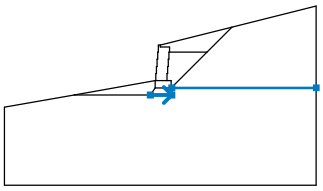
Safety factors			
Safety factor for steel strength :	SF_t =	1.50	[–]
Safety factor for pull out resistance (soil) :	SF_e =	1.50	[–]
Safety factor for pull out resistance (grouting) :	SF_c =	1.50	[–]

[Redi-Rock - Redi-Rock Wall + (32 bit) | version 5.2024.137.0 | Copyright © 2025 Fine spol. s r.o. All Rights Reserved | www.finesoftware.eu]
[Redi-Rock International | (231) 237 - 9500 ext 3010| engineering@redi-rock.com| www.redi-rock.com]

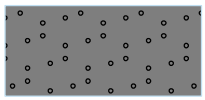
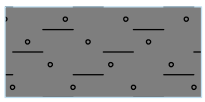
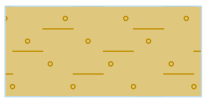
Interface

No.	Interface location	Coordinates of interface points [ft]					
		x	z	x	z	x	z
1		-32.80	-13.09	-18.10	-10.50	-1.09	-7.50
		-0.95	-7.50	-0.95	-6.00	-0.82	-6.00
		-0.82	-4.50	-0.69	-4.50	-0.69	-3.00
		-0.55	-3.00	-0.55	-1.50	-0.42	-1.50
		-0.42	0.00	0.00	0.00	15.05	3.76
		32.80	8.20				
2		1.92	-1.50	9.79	-1.50	15.05	3.76
3		0.00	0.00	0.00	-0.42	1.92	-0.42
4		-0.95	-7.50	1.38	-7.50	1.38	-6.00
		1.51	-6.00	1.51	-4.50	1.65	-4.50
		1.65	-3.00	1.78	-3.00	1.78	-1.50
		1.92	-1.50	1.92	-0.42		
5		2.29	-9.00	9.79	-1.50		
6		1.38	-7.50	2.29	-7.50		
7		-1.09	-9.00	2.29	-9.00	2.29	-7.50

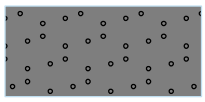
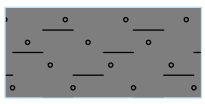
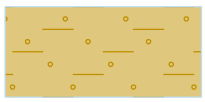
[Redi-Rock - Redi-Rock Wall + (32 bit) | version 5.2024.137.0 | Copyright © 2025 Fine spol. s r.o. All Rights Reserved | www.finesoftware.eu]
[Redi-Rock International | (231) 237 - 9500 ext 3010| engineering@redi-rock.com| www.redi-rock.com]

No.	Interface location	Coordinates of interface points [ft]					
		x	z	x	z	x	z
8		-18.10	-10.50	-2.09	-10.50	-1.09	-9.00
		-1.09	-7.50				
9		2.29	-9.00	2.41	-9.00		
10		-2.09	-10.50	2.41	-10.50	2.41	-9.00
		32.80	-9.00				

Soil parameters - effective stress state

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [psf]	γ [pcf]
1	Well graded sand (SW), medium dense		36.50	0.0	127.0
2	Sandy clay (CS), firm consistency		24.50	280.0	118.0
3	Sandy clay (CS)		24.50	280.0	118.0

Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [pcf]	γ_s [pcf]	n [–]
1	Well graded sand (SW), medium dense		127.0		
2	Sandy clay (CS), firm consistency		118.0		
3	Sandy clay (CS)		118.0		

[Redi-Rock - Redi-Rock Wall + (32 bit) | version 5.2024.137.0 | Copyright © 2025 Fine spol. s r.o. All Rights Reserved | www.finesoftware.eu]
[Redi-Rock International | (231) 237 - 9500 ext 3010| engineering@redi-rock.com| www.redi-rock.com]

Soil parameters

Well graded sand (SW), medium dense

Unit weight :	γ =	127.0 pcf
Stress-state :	effective	
Shear strength :	Mohr-Coulomb	
Angle of internal friction :	φ_{ef} =	36.50 °
Cohesion of soil :	c_{ef} =	0.0 psf
Saturated unit weight :	γ_{sat} =	127.0 pcf

Sandy clay (CS), firm consistency

Unit weight :	γ =	118.0 pcf
Stress-state :	effective	
Shear strength :	Mohr-Coulomb	
Angle of internal friction :	φ_{ef} =	24.50 °
Cohesion of soil :	c_{ef} =	280.0 psf
Saturated unit weight :	γ_{sat} =	118.0 pcf

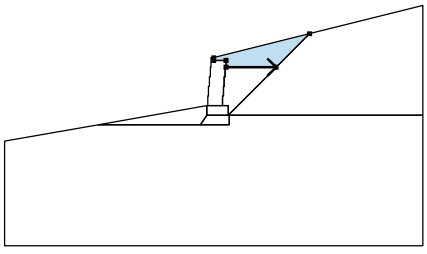
Sandy clay (CS)

Unit weight :	γ =	118.0 pcf
Stress-state :	effective	
Shear strength :	Mohr-Coulomb	
Angle of internal friction :	φ_{ef} =	24.50 °
Cohesion of soil :	c_{ef} =	280.0 psf
Saturated unit weight :	γ_{sat} =	118.0 pcf

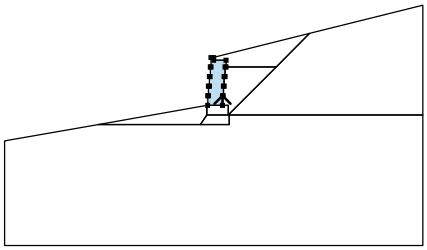
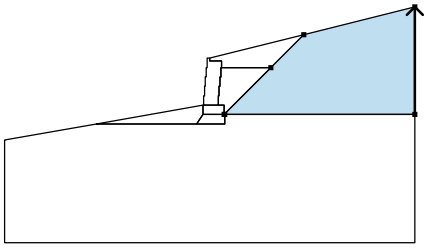
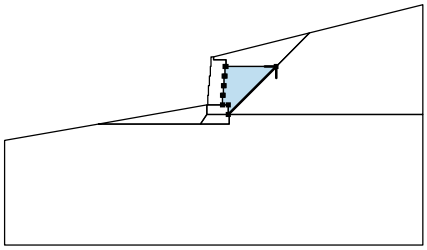
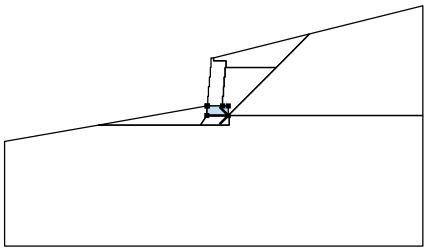
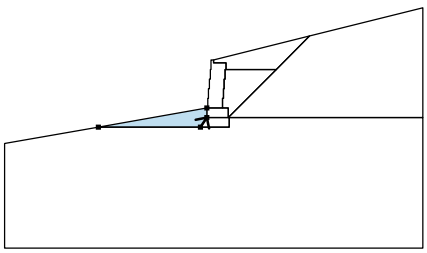
Rigid Bodies

No.	Name	Sample	γ [pcf]
1	Material of structure		120.0

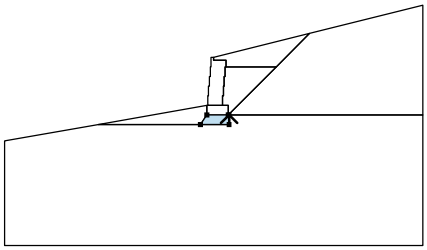
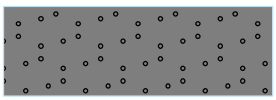
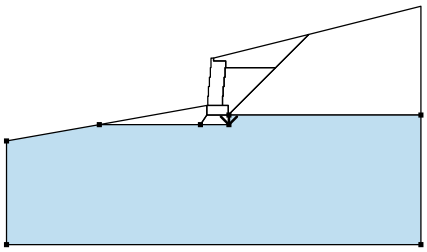
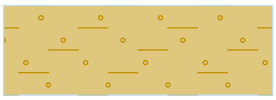
Assigning and surfaces

No.	Surface position	Coordinates of surface points [ft]				Assigned soil
		x	z	x	z	
1		1.92	-1.50	9.79	-1.50	Well graded sand (SW), medium dense
		15.05	3.76	0.00	0.00	
		0.00	-0.42	1.92	-0.42	

[Redi-Rock - Redi-Rock Wall + (32 bit) | version 5.2024.137.0 | Copyright © 2025 Fine spol. s r.o. All Rights Reserved | www.finesoftware.eu]
[Redi-Rock International | (231) 237 - 9500 ext 3010| engineering@redi-rock.com| www.redi-rock.com]

No.	Surface position	Coordinates of surface points [ft]				Assigned soil
		x	z	x	z	
2		1.38	-7.50	1.38	-6.00	Material of structure
		1.51	-6.00	1.51	-4.50	
		1.65	-4.50	1.65	-3.00	
		1.78	-3.00	1.78	-1.50	
		1.92	-1.50	1.92	-0.42	
		0.00	-0.42	0.00	0.00	
		-0.42	0.00	-0.42	-1.50	
		-0.55	-1.50	-0.55	-3.00	
		-0.69	-3.00	-0.69	-4.50	
		-0.82	-4.50	-0.82	-6.00	
		-0.95	-6.00	-0.95	-7.50	
3		32.80	-9.00	32.80	8.20	Sandy clay (CS)
		15.05	3.76	9.79	-1.50	
		2.29	-9.00	2.41	-9.00	
4		2.29	-9.00	9.79	-1.50	Well graded sand (SW), medium dense
		1.92	-1.50	1.78	-1.50	
		1.78	-3.00	1.65	-3.00	
		1.65	-4.50	1.51	-4.50	
		1.51	-6.00	1.38	-6.00	
		1.38	-7.50	2.29	-7.50	
5		-1.09	-9.00	2.29	-9.00	Material of structure
		2.29	-7.50	1.38	-7.50	
		-0.95	-7.50	-1.09	-7.50	
6		-2.09	-10.50	-1.09	-9.00	Sandy clay (CS)
		-1.09	-7.50	-18.10	-10.50	

[Redi-Rock - Redi-Rock Wall + (32 bit) | version 5.2024.137.0 | Copyright © 2025 Fine spol. s r.o. All Rights Reserved | www.finesoftware.eu]
[Redi-Rock International | (231) 237 - 9500 ext 3010| engineering@redi-rock.com| www.redi-rock.com]

No.	Surface position	Coordinates of surface points [ft] x	z	x	z	Assigned soil
7		2.41	-10.50	2.41	-9.00	Well graded sand (SW), medium dense
		2.29	-9.00	-1.09	-9.00	
		-2.09	-10.50			
8		2.41	-9.00	2.41	-10.50	Sandy clay (CS)
		-2.09	-10.50	-18.10	-10.50	
		-32.80	-13.09	-32.80	-29.49	
		32.80	-29.49	32.80	-9.00	

Water

Water type : No water

Tensile crack

Tensile crack not input.

Earthquake

Earthquake not included.

Settings of the stage of construction

Design situation : permanent

Results (Construction stage 1)

Analysis 1

Circular slip surface

Slip surface parameters							
Center :	x =	-3.10	[ft]	Angles :	α_1 =	-26.12	[°]
	z =	2.71	[ft]		α_2 =	88.81	[°]
Radius :	R =	12.88	[ft]				
The slip surface after optimization.							

Total weight of soil above the slip surface: 11829.5 lbf/ft

Slope stability verification (Bishop)

Sum of active forces : F_a = 5395.5 lbf/ft

Sum of passive forces : F_p = 11213.2 lbf/ft

Sliding moment : M_a = 69494.4 lbfft/ft

Resisting moment : M_p = 144426.1 lbfft/ft

Factor of safety = 2.08 > 1.50

[Redi-Rock - Redi-Rock Wall + (32 bit) | version 5.2024.137.0 | Copyright © 2025 Fine spol. s r.o. All Rights Reserved | www.finesoftware.eu]
[Redi-Rock International | (231) 237 - 9500 ext 3010| engineering@redi-rock.com| www.redi-rock.com]

Slope stability ACCEPTABLE

[Redi-Rock - Redi-Rock Wall + (32 bit) | version 5.2024.137.0 | Copyright © 2025 Fine spol. s r.o. All Rights Reserved | www.finesoftware.eu]
[Redi-Rock International | (231) 237 - 9500 ext 3010| engineering@redi-rock.com| www.redi-rock.com]